

REMARKS

Summary of Office Action

As an initial matter, Applicants note with appreciation that the Examiner appears to have withdrawn all of the rejections set forth in the previous Office Action.

Claims 58-88 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over WO 03/070662 A, relied on in the form of its alleged English equivalent, Schunk et al., US 2005/0130827 A1 (hereafter "SCHUNK").

Claims 58-88 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over, Garcia et al., US 2002/0164481 A1 (hereafter "GARCIA").

Response to Office Action

Reconsideration and withdrawal of the rejections of record are respectfully requested, in view of the following remarks.

Response to Rejection under 35 U.S.C. § 103(a) over SCHUNK

Claims 58-88, i.e., all claims of record, are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SCHUNK. The rejection alleges, *inter alia*, that SCHUNK "suggests the instantly claimed hydrolysis of a metal alkoxide in water and in the presence of surfactants to form nanoparticles after solvent removal". The Examiner concedes that SCHUNK "may differ as to the use of substoichiometric amount of water" but asserts "same is near enough to that taught as to be patentably indistinct".

Applicants respectfully traverse this rejection. In particular, it is noted that independent claim 58, for example, is drawn to process for the production of an amphiphilic nanoscale particle that comprises a hydrolyzable lipophilic moiety on a surface thereof, which process comprises (a) subjecting at least one hydrolyzable compound which comprises at least one hydrolyzable lipophilic group to a hydrolysis and condensation reaction with a substoichiometric amount of water to obtain a plurality of amphiphilic nanoscale particles and (b) removing liquid to obtain the plurality of amphiphilic nanoscale particles in a form of a powder.

In this regard, the present application (as published) states, *inter alia* (emphasis added):

[0012] The particles according to the present invention can surprisingly be dispersed directly both in aqueous and in organic media, without requiring additional surface modification. The amphiphilic particles according to the invention can, for example, astonishingly be dispersed directly without further treatment both in water and in toluene. When the amphiphilic particles are dispersed with nonpolar solvents, it should be ensured that the solvent is essentially anhydrous in order to avoid hydrolysis of the hydrolyzable groups.

[0014] Without wishing to be bound to a theory, it is suspected that this surprising effect can be explained by the lipophilic hydrolyzable radicals present on the particle surface being highly compatible with nonpolar organic solvents and agglomeration thus being prevented. The easy dispersibility in water can be explained, for example, by the hydrolyzable lipophilic radicals being hydrolyzed in the water, such that only hydrophilic groups which are readily compatible with the polar dispersion medium remain on the surface.

[0027] According to the invention, the hydrolysis and condensation reaction is carried out such that the hydrolyzable compounds are incompletely hydrolyzed and nanoparticles are formed, i.e. the nanoscale particles formed still have hydrolyzable groups on the surface. The person skilled in the art faced with the task of incomplete hydrolyzing the hydrolyzable compounds is familiar with how this is achieved by suitable adjustment of the abovementioned parameters. Some preferred conditions are explained below.

In contrast and as acknowledged by the Examiner, SCHUNK fails to teach or suggest, *inter alia*, the hydrolysis and condensation of a (any) hydrolyzable compound with a substoichiometric

amount of water. On the contrary, in paragraph [0064] thereof (relied upon by the Examiner)

SCHUNK states (emphasis added):

The relative proportion of TEOS (again when using TEOS, PEG and nitric acid) is indicated by the "r value", which is the molar ratio of water to Si (from the TEOS). For complete hydrolysis, for which four water molecules are naturally necessary, the r value is 4. In a preferred embodiment, the r value (ratio of water content to TEOS) is from 10 to 20, with an r value in the range from 12 to 18 being particularly preferred. At large r values, i.e. at a low Si concentration, particulate aggregates are formed, while at low r values the macropores are isolated, i.e. the transport channels are lost. The size of the macropores is likewise influenced by the r value, albeit not as greatly as by variation of the PEG content, and is in the range from 80 μm (small r value) to 5 μm (large r value).

Accordingly, SCHUNK not only fails to teach or suggest a substoichiometric amount of water but expressly recommends a significant molar excess of water (preferably an at least three-fold molar excess). In other words, SCHUNK teaches away from the claimed process for this reason alone.

Applicants further note that SCHUNK is far from teaching or suggesting a material in the form of particles, let alone nanoscale particles. On the contrary, SCHUNK is expressly directed to a process for the production of a monolithic (ceramic) material (see, e.g., title and abstract of SCHUNK), in which process particles would represent an undesirable product. In this regard see, for example, paragraph [0063] of SCHUNK (emphasis added):

When TEOS and nitric acid are used together with PEG, a PEG content in the range from 2 to 10% by weight based on the total weight is preferred, with from 3 to 6% by weight being particularly preferred. In the case of a PEG content below 3%, the macropores are mostly isolated, while at a PEG content above 6%, the porous structure begins to break down and individual particles can be formed, i.e. the monolithic property is lost. The diameter of the macropores can be varied in the range from 1 to 80 μm by variation of the PEG content in the range from 3 to 6% by weight, with a high PEG content corresponding to a small diameter of the macropores.

This is yet another reason why SCHUNK is unable to render obvious the claimed subject matter.

Applicants submit that for at least all of the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of any of the claims of record over SCHUNK. In view thereof, withdrawal of the instant rejection under 35 U.S.C. § 103(a) is warranted, which action is respectfully requested.

Response to Rejection under 35 U.S.C. § 103(a) over GARCIA

Claims 58-88 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over GARCIA. The rejection alleges, *inter alia*, that GARCIA “suggests the instantly claimed hydrolysis of a metal alkoxide in water and in the presence of surfactants to form nanoparticles after solvent removal”. The Examiner concedes that GARCIA “may differ as to the use of substoichiometric amount of water” but asserts “same is near enough to that taught as to be patentably indistinct”.

Applicants respectfully traverse this rejection as well. In particular, it is noted again that independent claim 58, for example, is drawn to process for the production of an amphiphilic nanoscale particle that comprises a hydrolyzable lipophilic moiety on a surface thereof, which process comprises (a) subjecting at least one hydrolyzable compound which comprises at least one hydrolyzable lipophilic group to a hydrolysis and condensation reaction with a substoichiometric amount of water to obtain a plurality of amphiphilic nanoscale particles and (b) removing liquid to obtain the plurality of amphiphilic nanoscale particles in a form of a powder.

In this regard, the present application (as published) states, *inter alia* (emphasis added):

[0012] The particles according to the present invention can surprisingly be dispersed directly both in aqueous and in organic media, without requiring additional surface modification. The amphiphilic particles according to the invention can, for example, astonishingly be dispersed directly without further treatment both in water and in toluene. When the amphiphilic particles are dispersed with nonpolar solvents, it should be ensured that the solvent is essentially anhydrous in order to avoid hydrolysis of the hydrolyzable groups.

[0014] Without wishing to be bound to a theory, it is suspected that this surprising effect can be explained by the lipophilic hydrolyzable radicals present on the particle surface being highly compatible with nonpolar organic solvents and agglomeration thus being prevented. The easy dispersibility in water can be explained, for example, by the hydrolyzable lipophilic radicals being hydrolyzed in the water, such that only hydrophilic groups which are readily compatible with the polar dispersion medium remain on the surface.

[0027] According to the invention, the hydrolysis and condensation reaction is carried out such that the hydrolyzable compounds are incompletely hydrolyzed and nanoparticles are formed, i.e. the nanoscale particles formed still have hydrolyzable groups on the surface. The person skilled in the art faced with the task of incomplete hydrolyzing the hydrolyzable compounds is familiar with how this is achieved by suitable adjustment of the abovementioned parameters. Some preferred conditions are explained below.

In contrast and as acknowledged by the Examiner, GARCIA fails to teach or suggest, *inter alia*, the hydrolysis and condensation of a (any) hydrolyzable compound with a substoichiometric amount of water. In particular, GARCIA refers only generally to a silicate precursor solution that undergoes hydrolysis and condensation to form a sol-gel precursor, which sol-gel precursor is mixed with a specified block-copolymer solution whereby a hybrid inorganic nanostructured material is produced. Thereafter solvent is removed from the hybrid material to produce individual nanostructure materials that are calcinated to form a superparamagnetic nanostructure material. See, e.g., abstract and paragraph [0012] of GARCIA.

There is no indication whatsoever in GARCIA that the use of a substoichiometric amount of water in the hydrolysis and condensation of the silicate precursor is contemplated, let alone

advantageous. On the contrary, according to paragraph [0018] of GARCIA the sol-gel precursor is “molecularly compatible with only the hydrophilic polymer”, which is a clear indication to one of ordinary skill in the art that a complete hydrolysis and condensation has to be carried out, i.e., that an at least stoichiometric amount of water must be used.

In other words, if a substoichiometric amount of water were used in the hydrolysis and condensation of the silicate precursor the hydrolyzed and condensed sol-gel precursor would be amphiphilic (due to the presence of both hydrophilic and hydrolyzable lipophilic groups on the surface of the nanoscale particles), in which case it can reasonably be assumed that it would be molecularly compatible not only with the hydrophilic polymer (block) but also with the lipophilic polymer (block) of the amphiphilic block copolymer. Accordingly, GARCIA clearly indicates that a complete hydrolysis and condensation of the silicate precursor (resulting in the complete removal of the hydrolyzable lipophilic groups on the silicate precursor) is to be carried out, resulting in only hydrophilic surface groups. Consequently, also GARCIA teaches away from the instantly claimed process.

It further is to be taken into account that the hybrid inorganic nanostructured material of GARCIA from which solvent has been removed is not to be used as such, but in calcinated form. In this case it is apparently of no relevance whatsoever whether or not the hybrid inorganic nanostructured material is amphiphilic or not, i.e., whether or not it can be dispersed directly both in aqueous and in organic media. This is yet another reason why GARCIA fails to prompt one of ordinary skill in the art to provide amphiphilic nanoscale particles by the process disclosed therein.

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Applicants submit that for at least all of the foregoing reasons, also GARCIA is unable to render obvious the subject matter of any of the claims of record, wherefore the instant rejection is without merit and withdrawal thereof is warranted as well.

CONCLUSION

In view of the foregoing, it is believed that all of the claims in this application are in condition for allowance, wherefore an early issuance of the Notices of Allowance and Allowability is respectfully solicited. If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to contact the undersigned at the telephone number below.

Respectfully submitted,
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